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Pacific Insects 6 (3): 483-488 **November 10, 1964**

A NEW AQUATIC ORIBATID MITE FROM KAUAI ISLAND

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Abstract: Taxonomic and ecological notes on an aquatic species of oribatid mite are presented. This species, found in a taro patch on Kauai, is regarded as a new species representing a new genus.

It is well-known that most of the members of Oribatei are terrestrial animals living mainly in moss as well as in surface layers of soil. A very few members of Oribatei, however,

are found under the surface of water. Some members of the families Malaconothridae, Nothridae, Cymbaeremaeidae and Limnozetidae are often found in very moist sphagmum, but they cannot be considered true aquatic animals. On the other hand, most members of the family Hydrozetidae live on water plants or dead leaves under water. Newell (1948) studied their interesting ecological habits and there is no doubt that they are true aquatic animals. According to Willmann (1931) two species of other families, namely *Trhypochthoniellus setosus* (Willmann) and *Heterozetes palustris* Willmann, occur on "untergetauchten Wasserpflanzen." We have, however, no report which mentions the precise status of these species in water.

In May 1964, I made a collecting trip to Kauai I. (Hawaiian Is.) and observed an oribatid mite living under water in a taro patch. This species is considered as a new species and represents the following new genus which belongs to the family Trhypochthoniidae.

Genus **Hydronothrus** Aoki, n. gen.

This genus exhibits the characters of the genus *Afronothrus* Wallwork, 1961, as well as the genus *Trhypochthonius* Berlese, 1904. *Hydronothrus* is very similar to *Afronothrus* in having the long interlamellar setae, the longitudinally aligned notogastral fissures, 2 pairs of adanal setae, 3 unequal-sized claws on each leg, the setae c_3 situated on a tubercle and smooth notogastral setae, while it bears a resemblance to *Trhypochthonius* in having one pair of adanal setae, the posterior notogastral setae which are not conspicuously longer than the remaining setae, and in showing neotrichy on the genital plates. The characteristic features of *Hydronothrus* are the number of notogastral setae, the setal formula of epimerata and the shape of setae *ft'* on each tarsus (Table 1). Exobothridial setae and

Table 1. Comparison of characters of 3 closely related genera belonging to the family Trhypochthoniidae.

	Trhypochthonius Berlese	*Hydronothrus* n. gen.	*Afronothrus* Wallwork
Interlamellar setae	short	long, extend far beyond dorso-sejugal suture	long, extend far beyond dorso-sejugal suture
Adanal setae	3 pairs	2 pairs	2 pairs
Dorsal fissures	aligned transversely	aligned longitudinally	aligned longitudinally
Claws	equal in size	unequal in size	unequal in size
Seta c_3	not on tubercle	on tubercle	on tubercle
Notogastral setae	generally barbed	smooth	almost smooth
Anal setae	present	present	lacking (?)
Posterior pairs of notogastral setae	normal	normal	conspicuously long
Number of pairs of notogastral setae	15	14	15
Setal formula of epimerata	(3-1-3-3)	(3-0-3-2)	(3-1-3-2)
Setae *ft'* on tarsi	normal	thickened	normal

notogastral setae f_1 are lacking.

Type species: *Hydronothrus crispus*, n. sp.

Hydronothrus crispus Aoki, n. sp. Fig. 1

MATERIAL EXAMINED: Holotype (BISHOP 3642), Hanalei, near sea level, Kauai I., Hawaiian Is., under the water of taro patch, 22. V. 1964, collected by J. Aoki. 14 paratypes: same data.

Measurements: Length: 520, 520 and 552 μ; width: 293, 295 and 315 μ (by 3 undepressed specimens).

Prodorsum: Rostrum somewhat roundly projected at tip, provided with a short longitudinal ridge on each side (clearly observed on dissected animals); the ridges run almost parallel and bear rostral setae on their anterior extremities; another undulating ridge connects the longitudinal ridges anteriorly. Rostral setae almost as long as their mutual distance, curling downwards in their distal halves. Lamellar setae situated rather close to each other, their mutual distance less than that of rostral setae; a faint transverse ridge connects the insertions of lamellar setae, extending laterally to each side for as long as the mutual distance of the insertions; lamellar setae slightly curved, 1.5× as long as their mutual distance. Interlamellar setae conspicuously long, each extending beyond the insertion on the other side for a distance equal to 1/4 its length; the setae, in natural situation, directed upward although they are shown as directed backward in fig. 1A. The abovementioned 3 pairs of setae are all smooth. Exobothridial setae lacking. Opening of bothridium directed just laterally. Sensillus spatulate, with a fusiform head which bears a drop-shaped pale area in the middle section. Integument of prodorsum finely punctured.

Notogaster: Widest in posterior portion. A broad transparent band present on anterior margin. Posterior margin rounded, but with many undulations. Surface of notogaster reticulate, with 14 pairs of notogastral setae; f_1 and ps_3 lacking; setae in middle section have a tendency to curl proximally (hence the species name). All notogastral setae do not strikingly differ in length from each other, although f_2 is a little shorter; c_3 inserted on a small tubercle where the lateral margin of notogaster has a small indentation on each side; e_2 located a little anterior to level of e_1; f_2 a bit posterior to e_1. Two pairs of fissures (*ia* and *ip*) well visible; *ia* located laterally, just behind insertion of c_3 and it is difficult to observe it from the dorsal aspect; *ip* situated on level of h_1, anterior to h_2, aligned transversely; *im* cannot be seen. Grand opening *gla* very distinct, with a slit-like opening surrounded by a chitinous ring. On the lateral side of notogaster a long, slightly bent, chitinous ridge runs from *ia* to the insertion of h_3. A large dark-colored fleck found on each side, accompanying some wrinkles.

Anogenital region: Anal plate recognized as a pair of slender edges, provided with a pair of anal setae inserted about half-way along length of anal plates. Adanal plates with 2 pairs of long adanal setae, situated somewhat closer to outer margin than to inner; ad_1 longer than distance between ad_1 and ad_2. The fissures *iad* located hear anterior border of adanal plates, drop-shaped, aligned obliquely. Outline of genital aperture recognized distinctly only in posterior and anterior parts; lateral margin cannot be well observed; the postero-interior corner of each plate cut off obliquely, so that a triangular interspace appears anterior to anal aperture. Genital plate provided with 9 setae, arranged progressive-

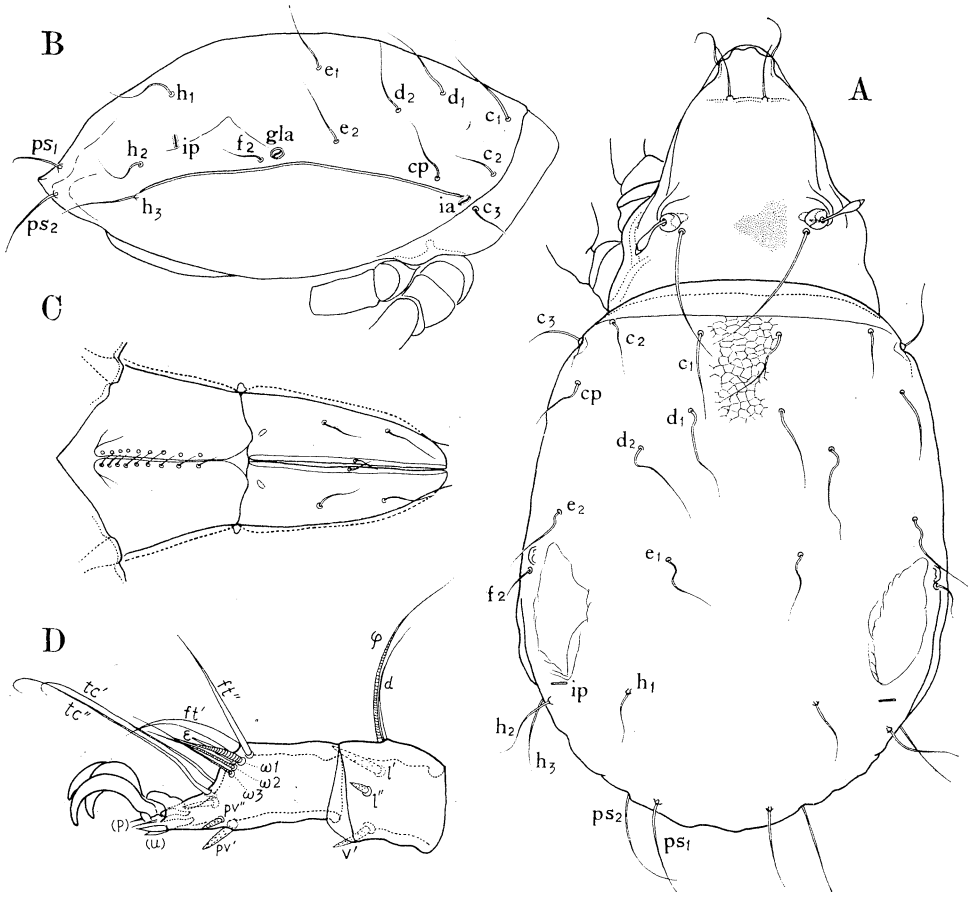

Fig. 1. *Hydronothrus crispus* n. gen., n. sp. A, dorsal aspect; B, lateral apect of hysterosoma; C, Anogenital region; D, Tarsus and tibia of leg I.

ly closer to each other forwards. No aggenital setae.

Epimeral region: Integument finely punctured. Apodemata I, II and III most distinctly chitinized, while apo. sj and apo. IV weakly chitinized. The setal formula seems to be (3–0–3–2). Marginal epimeral setae rather long, while the inner ones are very small and difficult to recognize.

Legs: All legs tridactyle, median claw shorter than lateral claws. Seta *ft'* of each leg is the thickest one, curving ventrally and terminating in a fine tip. Seta *tc* very long, extending far beyond tips of claws and curling distally; *tc* of leg IV longest. Tarsus I: *ft''* a straight seta, almost as long as *ft'* and far shorter than *tc*; solenidion ω_1, ω_2, ω_3 and ε situated very closely together; ventral setae *pv* short, thick, bud-shaped and rough; *pv'* larger than *pv''*; ventrodistal setae *u* short, thick and smooth. Tibia I: seta φ and *d* very closely together, usually fitting each other; φ longer than *d*; setae *l* and *v'* rough and bud-shaped; *l''* shorter than *l'* as well as *v'*.

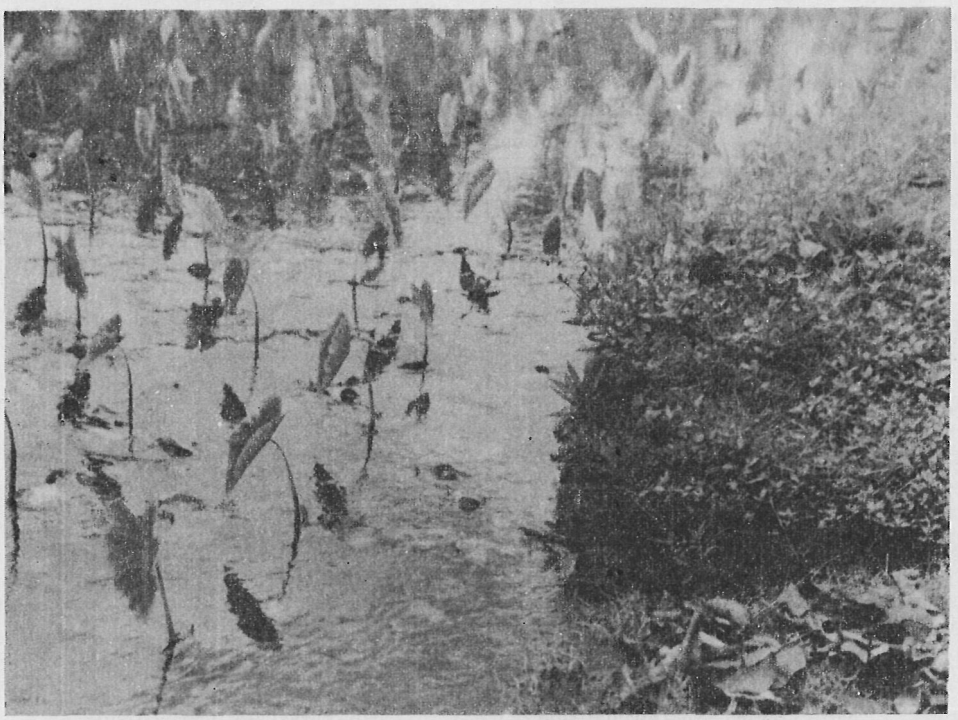

Fig. 2. The taro-patch at Hanalei where *Hydronothrus crispus* n. sp. was found.

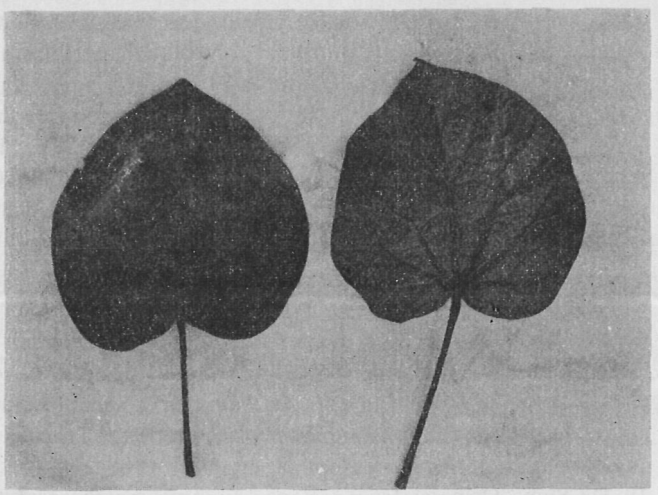

Fig. 3. Dead leaves of *Hibiscus tiliaceus* L. which were under water in the taro-patch and were occupied by the oribatid mites. Left: adaxial side; right: abaxial side.

Observation on type locality: The taro patch where the oribatid mites were found is located at Hanalei, in the northern part of the island. This patch of young taro plants was entirely covered with water about 10 cm deep. A grove of various kinds of plants grew in the area directly along one side of the patch. Situated among this grove is an inlet where gentle streams of water flow through, into the taro patch. Many dead leaves of *Hibiscus tiliaceus* L.* were found floating on the water or lying under the water. Individuals of *Hydronothrus crispus* were found resting or very slowly crawling on the undersides of these leaves. The leaves were found in various situations (fig. 4) and it is interesting to note that mites were found only on a few leaves which seemed to be situated satisfac-

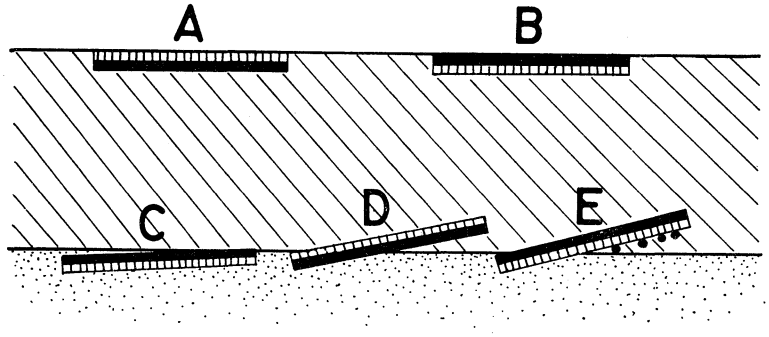

Fig. 4. Various situations of dead leaves in water. A, floating leaf (adaxial side down); B, floating leaf (adaxial side up); C, buried leaf in soil; D, partly buried leaf (adaxial side down); E, partly buried leaf (adaxial side up). The mites were found on E.

torily for the mites. The leaves on which the mites were found were those positioned as shown in fig. 4E: the leaves facing with their abaxial side toward the bottom surface, in contact with the bottom soil in some part and keeping a little apart from the soil in the remaining parts. The mites could not be found on floating leaves (fig. 4 A, B) or on buried leaves (fig. 4C). Even in the case of leaves resting loosely on the bottom (fig. 4 D, E) the mites were hardly found on the leaves facing with their adaxial side to the bottom (fig. 4D). It is, however, not certain whether this phenomenon concerns the vertical position of the leaves in the water or degrees of decaying of the dead leaves. It should be considered very likely that the floating leaves are too fresh and the buried ones are too old for the mites.

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* Kindly determined by Miss Marie Neal of Bishop Museum.